**teachers guide**

**Geothermal energy 7:**

**The geothermal alternative**

# Components

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|  | NAME | DESCRIPTION | AUDIENCE |
|  | *The geothermal alternative*teachers guide | The guide describes how a case study and worksheet can be used by students to reinforce concepts of specific and latent heat. | teachers |
|  | *Cooling the campus*worksheet | Students analyse a proposal to air-condition a university campus using geothermal energy. | students |
|  | *How cool is your pool?*worksheet | Students analyse data on heat losses from a swimming pool. | students |
|  | *Swimming pool model*spreadsheet | This spreadsheet contains data that model heat losses from a heated swimming pool, over a year, at two different times of day. | students |

Purpose

To provide opportunities for students to apply the concepts of specific heat, latent heat, energy supply and loss to case studies involving geothermal energy.

# Activity summary

Outcomes

Students:

* understand scientists use a variety of strategies to solve problems that involve energy transfer systems;
* analyse and manipulate data in relation to real world problems; and
* use concepts of specific heat, latent heat and the mathematical relationships Q = m c ΔT and Q = m L to solve problems.



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| ACTIVITY | POSSIBLE STRATEGY |
| Case study: students read and complete the worksheet, *Cooling the campus*. | teacher-led discussionstudent activity as individuals or pairs |
| Students read and complete the worksheet, *How cool is your pool*, with the aid of an Excel spreadsheet where possible. | student activity as individuals or pairs |

# Technical requirements

The guide and worksheets require Adobe Reader, which is a free download from adobe.com. The worksheets are also provided in Microsoft Word format. Data for the worksheet, *How cool is your pool?*, is also provided in Microsoft Excel format.

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# Associated SPICE resources

*Geothermal energy 7: The geothermal alternative* may be used in conjunction with related SPICE resources to investigate specific heat and latent heat.

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| DESCRIPTION | LEARNING PURPOSE |
| *Geothermal energy (overview)*This learning pathway shows how a number of SPICE resources can be combined to assist with teaching the topics of specific heat and latent heat. |  |
| *Geothermal energy 1: Heat beneath your feet*A video engages student interest in recent developments and future possibilities for the use of geothermal energy. | Engage |
| *Geothermal energy 2: Specific heat capacity*Students investigate the specific heat capacity of water in laboratory and problem- solving activities. | Explore |
| *Geothermal energy 3: Heating a pool*Students’ understanding of specific heat is developed through data analysis in the context of heating swimming pools using geothermal energy. | Explain |
| *Geothermal energy 4: Sustainable energy sources*Students reinforce and deepen their understanding of specific heat and geothermal energy through problem-solving activities. | Elaborate |
| *Geothermal energy 5: Latent heat*Students investigate latent heat through practical and problem-solving activities. | Explore |
| *Geothermal energy 6: Using geothermal energy*Students use an interactive learning object to develop an understanding of how latent heat is used in a number of devices. | Explain |
| *Geothermal energy 7: The geothermal alternative*Students use concepts developed throughout this sequence to analyse two case studies that involve use of geothermal energy. | Elaborate |

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Web: spice.wa.edu.au Email: spice@uwa.edu.au Phone: (08) 6488 3917

Centre for Learning Technology (M016) The University of Western Australia

35 Stirling Highway

Crawley WA 6009